Chapter 3
Integrity Testing for Existing Tanks

Contents

3.1 Introduction

3.1.1 Background

The July 14, 1986, final rule, which revised the standards for the management of HW tanks, required the installation of secondary containment structures on new HW tanks prior to their being placed into service. Owners and operators of HW tanks that were in existence on or before July 14, 1986, however, did not have to immediately install secondary containment structures on those tanks. (See Chapter 6, "Secondary Containment Requirements," to determine the date by which existing tanks must have secondary containment installed.) Instead, owners and operators were required to conduct an integrity assessment of existing HW tanks to prove that those HW tanks were not leaking or were not otherwise unfit for use. The Federal regulations required that those assessments were to have been completed by January 1988.

EPA periodically re-examines and re-defines the realm of HW. Wastes that are not currently regulated as HW may be regulated as such in the future. When wastes are re-defined as hazardous, the tank containing the "new" HW must receive an integrity assessment within 12 months if secondary containment structures have not yet been added to that tank.

3.1.2 Major Requirements

All of the integrity assessment requirements are addressed in Module A.

- **Module A: Integrity Testing for Existing HW Tanks.** This module describes elements of an integrity assessment addressing design standards, corrosion protection measures, and the results of leak tests or other types of tank integrity examination. [40 CFR 264/265.191]

3.2 Module A: Integrity Testing for Existing Tanks

3.2.1 Introduction

This module addresses integrity assessments on existing HW tanks that lack secondary containment, including tanks that contain recently designated HWs. After a non-hazardous waste is classified as a HW by EPA, facility owners/operators must conduct an assessment of the existing tank system's integrity. This must be done within 12 months of the date the waste becomes a hazardous waste.

Owners/operators, in conjunction with an independent, certified engineer, need to carefully select the type of leak test to be performed to determine a tank's integrity. Leak testing methods must be designed to deal with potential sources of error in the data derived from the test, such as:

- Temperature changes during testing;
- Evaporation losses; and
- Volumetric changes of trapped air and vapor pockets in a tank and piping. [4]

3.2.2 Milestones

Has the structural integrity of the existing HW tanks been certified?

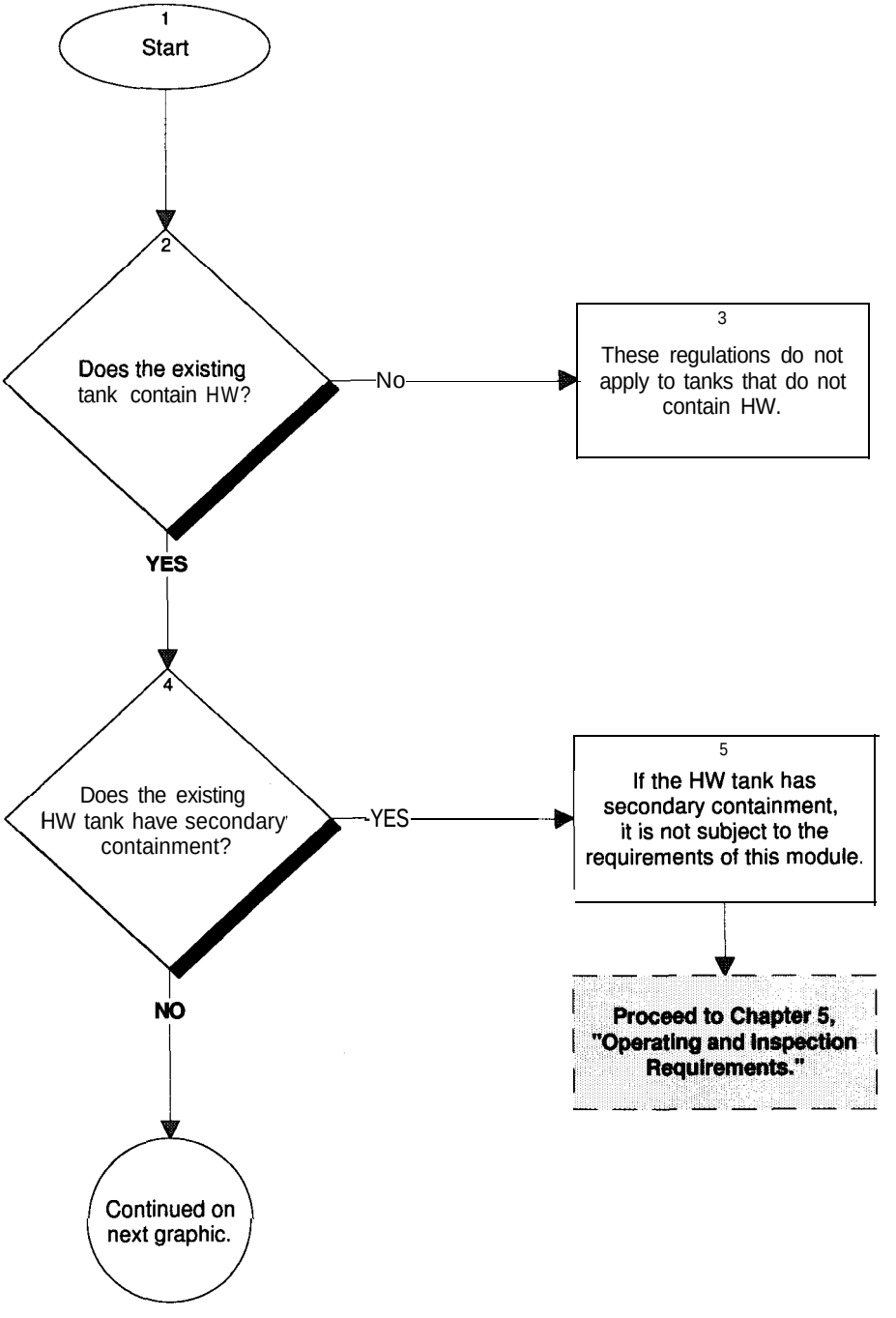
Existing tanks that lack secondary containment:

- Must have been assessed by January 12, 1988, or
- Must be assessed within 12 months of the date that a non-hazardous waste in a tank is designated as HW by EPA.

Existing HW tanks that were found to be leaking or otherwise unfit for service must be repaired or replaced as necessary before being certified and returned to use.

The following flowchart identifies the integrity testing requirements for existing HW tanks that lack secondary containment.

Figure 3.1: Integrity Testing for Existing Tanks



Step 1 Start

Step 2 If a non-HW that is currently being stored or treated in a tank is designated by EPA as a HW, that tank must receive an integrity assessment within 12 months of the date the non-hazardous waste became a HW.

Step 3 If the tank contains a substance other than a HW (such as a petroleum or chemical product), consult "Regulated Underground Storage Tanks" published by the DOE Office of Environmental Guidance (OEG) for assistance. [1]

Step 4 Secondary containment for HW tanks must include one or more of the following devices:

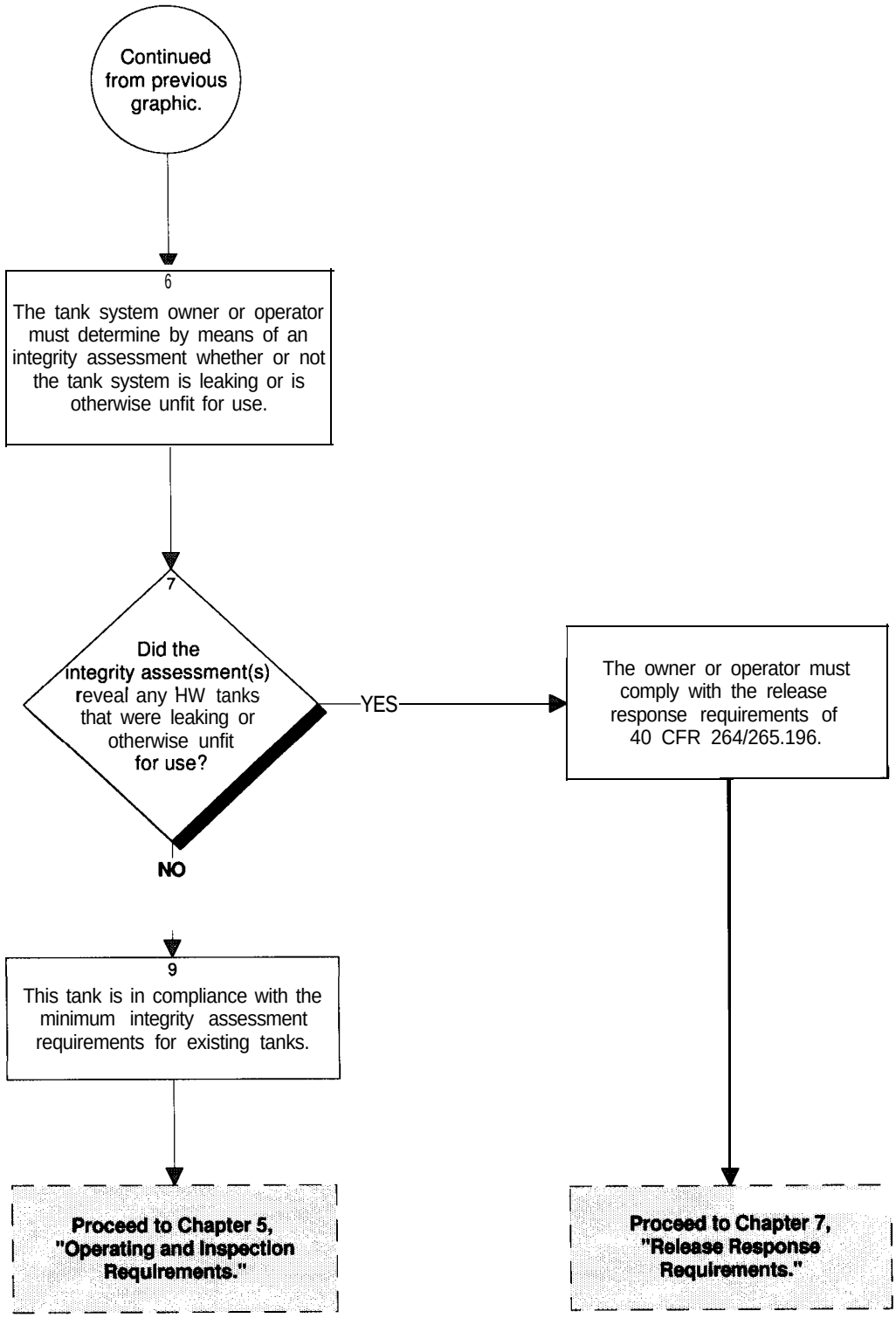
- A liner (external to the tank);
- A vault;
- A double-walled tank; or
- An equivalent device as approved by the Regional Administrator.

See Chapter 6, "Secondary Containment Requirements," for more details.

Step 5 Existing HW tanks were temporarily excluded from the secondary containment requirements of 40 CFR 264/265.193. Instead, existing tanks must be assessed to determine the structural integrity of the tank. All existing HW tanks must eventually receive secondary containment, but the schedule of compliance varies from that for new tanks.

- New tank systems must be provided with secondary containment prior to being placed into service;
- All existing tank systems used to store or treat EPA "F listed" hazardous wastes, Numbers F020, F021, F022, F023, F026, and F027, must have received secondary containment by January 12, 1989 (See Chapter 1, Section 1.2, for the definition of "F listed" wastes);
- For existing tank systems of known and documented age, secondary containment must have been provided by January 12, 1989, or when the tank system has reached 15 years of age, if that date is later; and
- For existing tank systems for which the age cannot be documented, secondary containment must be installed by January 12, 1995; but if the age of the **facility** is greater than 7 years, secondary containment must be provided by the time the **facility** reaches 15 years of age, or by January 12, 1989, whichever is later.

Existing tanks with secondary containment are not subject to integrity testing requirements.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6
The tank system owner or operator must determine by means of an integrity assessment whether or not the tank system is leaking or is otherwise unfit for use.
7
Did the integrity assessment(s) reveal any HW tanks that were leaking or otherwise unfit for use?
YES
The owner or operator must comply with the release response requirements of 40 CFR 264/265.196.
NO
9
This tank is in compliance with the minimum integrity assessment requirements for existing tanks.
Proceed to Chapter 5, "Operating and Inspection Requirements."
Proceed to Chapter 7, "Release Response Requirements."

Step 6 This integrity assessment must determine that the tank system is adequately designed and has sufficient structural strength and compatibility with the HW to be stored or treated to ensure that it will not collapse, rupture, or fail. At a minimum, this assessment must consider the following:

- Design standard(s), if available, according to which the tank and ancillary equipment were constructed;

  Note: Items for which design standards are needed include tank wall thickness, vents [both operating and emergency vents], pipes, valves, fittings, pumps, and other ancillary equipment; [4]

- Characteristics of the HW that have been and will be handled;
- Existing corrosion protection measures;
- Documented age of the tank system, if available (otherwise, an estimate of the age); and
- Results of a leak test, internal inspection, or other tank integrity examination such that:
  - For **non-enterable** underground tanks, the assessment must include a leak test that is capable of taking into account the effects of temperature variations, tank end deflection, vapor pockets, and high water table effects; and
  - For **enterable** underground tanks and for ancillary equipment, this assessment must include either a leak test, as described above, or other integrity examination that is certified by an independent, qualified, registered professional engineer in accordance with 40 CFR 270.11(d). For a facility that is requesting permitted status, the assessment must address the presence of cracks, leaks, corrosion, and erosion. An interim status facility does not need to submit the assessment to the Regional Administrator.

The owner or operator must obtain and file at the facility a written assessment reviewed and certified by an independent, qualified, registered professional engineer, in accordance with 40 CFR 270.11(d), that attests to the tank system's integrity.

Step 7 If an integrity assessment uncovers a leaking HW tank, it must be removed from service and repaired or replaced before resuming operation.

Step 8 See Chapter 7, "Release Response Requirements," if the integrity assessment uncovers a HW tank that is leaking. Chapter 7 contains the requirements from 40 CFR 264/265.196 for repairing leaking HW tanks and for reporting releases of HWs to the appropriate authorities.

Step 9 Completing the leak test satisfies the minimum integrity assessment requirements for existing tanks. However, if the owner or operator wishes to conduct other integrity assessments beyond a leak test, he/she should consult the practices described in the American Petroleum Institute (API) publication, *Guide for Inspection of Refinery Equipment*, Chapter XIII, "Atmospheric and Low-Pressure Storage Tanks." [5]

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Chapter 4
New Tank Construction and Installation Requirements

Contents

4.1 Introduction

4.1.1 Background

The design of a new HW tank must be adequate to ensure that the tank can safely store or treat HW for its intended lifetime. EPA requires the inclusion of a written design assessment with the submission of Part B of the permit application. This design assessment should include detailed charts and drawings in addition to written descriptions. Basic design information for many common types of HW tanks are available from the manufacturers of the tanks and fittings. Professional societies such as the National Association of Corrosion Engineers are also good sources of information for design specifications. The assessment must also contain a certification of the tank's acceptability for storing HW.

After providing an adequate design assessment for the new HW tank(s), the owner or operator must have the new HW tank inspected after installation to confirm that it was not damaged during installation. Any damage that does occur must be repaired before the HW tank is placed into operation.

4.1.2 Major Requirements

These requirements apply only to new HW tanks.

- **Module A: Design, Installation, and Assessment of New Tank Systems or Components.** This module addresses those requirements that must be met to safely construct and install new HW tanks. It also addresses requirements for conducting an assessment of the HW tank system's design. This design assessment must be conducted before the new HW tank is constructed or installed.

4.2 Module A: Design, Installation, and Assessment of New Tank Systems or Components

4.2.1 Introduction

Owners or operators of new HW tank systems must provide EPA with a written assessment of the system's structural integrity and acceptability for the storage or treatment of HW. This assessment will be used by a Regional Administrator of the EPA to review and approve, or to disapprove, the tank system's design.

The design of new HW tanks must take into consideration many diverse environmental factors including geology, climate, and soil chemistry. Other factors that must be considered include the characteristics of the HW that is scheduled for storage or treatment in the new tank. These characteristics (e.g., ignitability, corrosiveness, and/or reactivity) may influence the type of tank material chosen (these characteristics are defined in Chapter 1, Section 1.2). The radioactive component of mixed HWs may also influence the type of HW tank material selected. Types of material available include fiberglass-reinforced plastic, concrete, and steel along with various other metal alloys and composite materials.

After the design has been approved by the Regional Administrator, the tank must be installed without incurring damage. After installation, the tank must be inspected for possible damage; if damage has occurred, the tank must be repaired before being placed into operation.

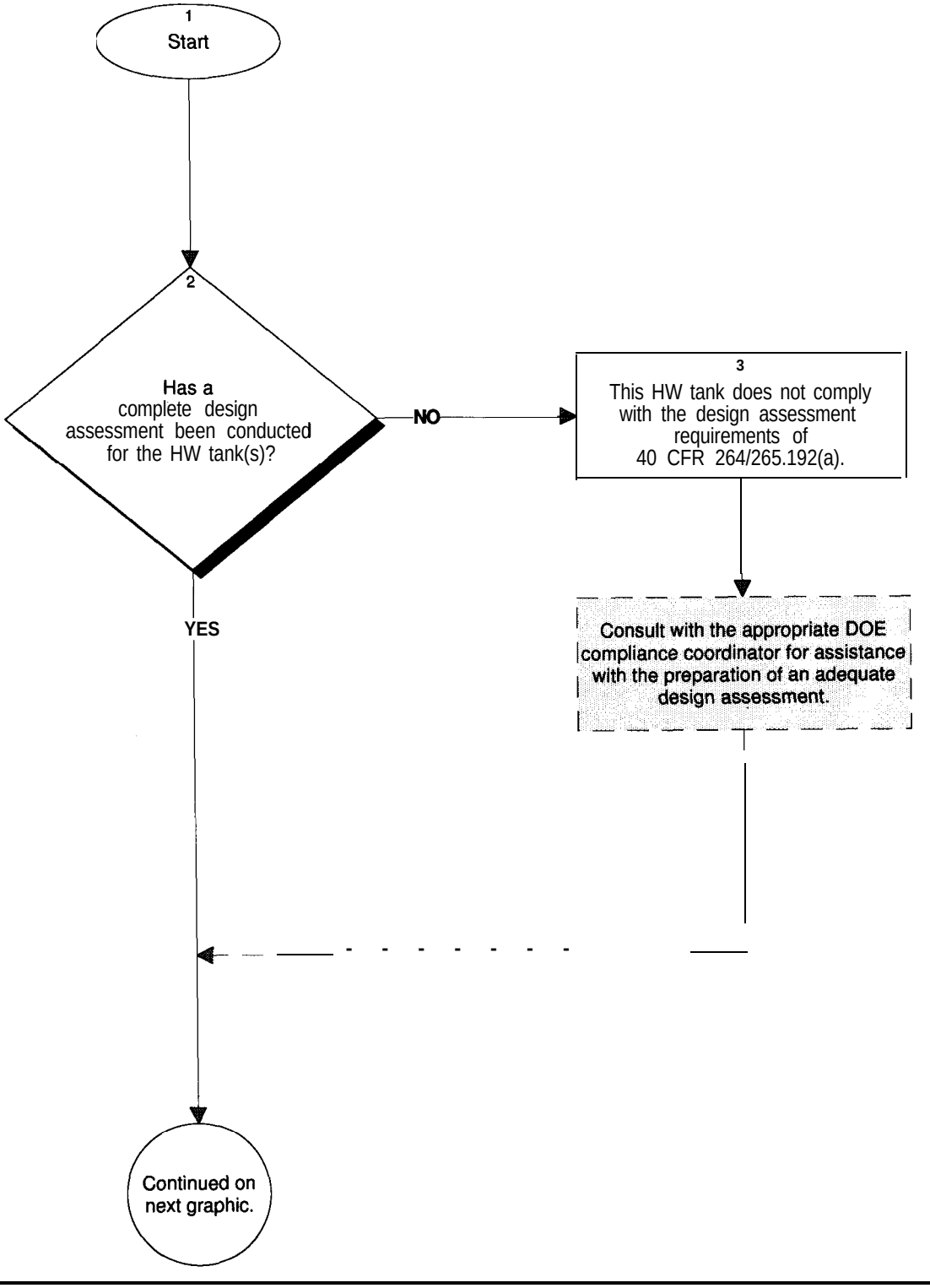
4.2.2 Milestones

Has the tank been adequately designed, installed, and assessed?

- The design must be adequate to provide safe containment of the HW.
- The installation and subsequent inspection of the installation must ensure that the installation process has not damaged the HW tank.

The following flowchart describes design, installation, and assessment requirements for new HW tanks.

Figure 4.1: Design, Installation, and Assessment of New Tank Systems or Components



Step 1 Start

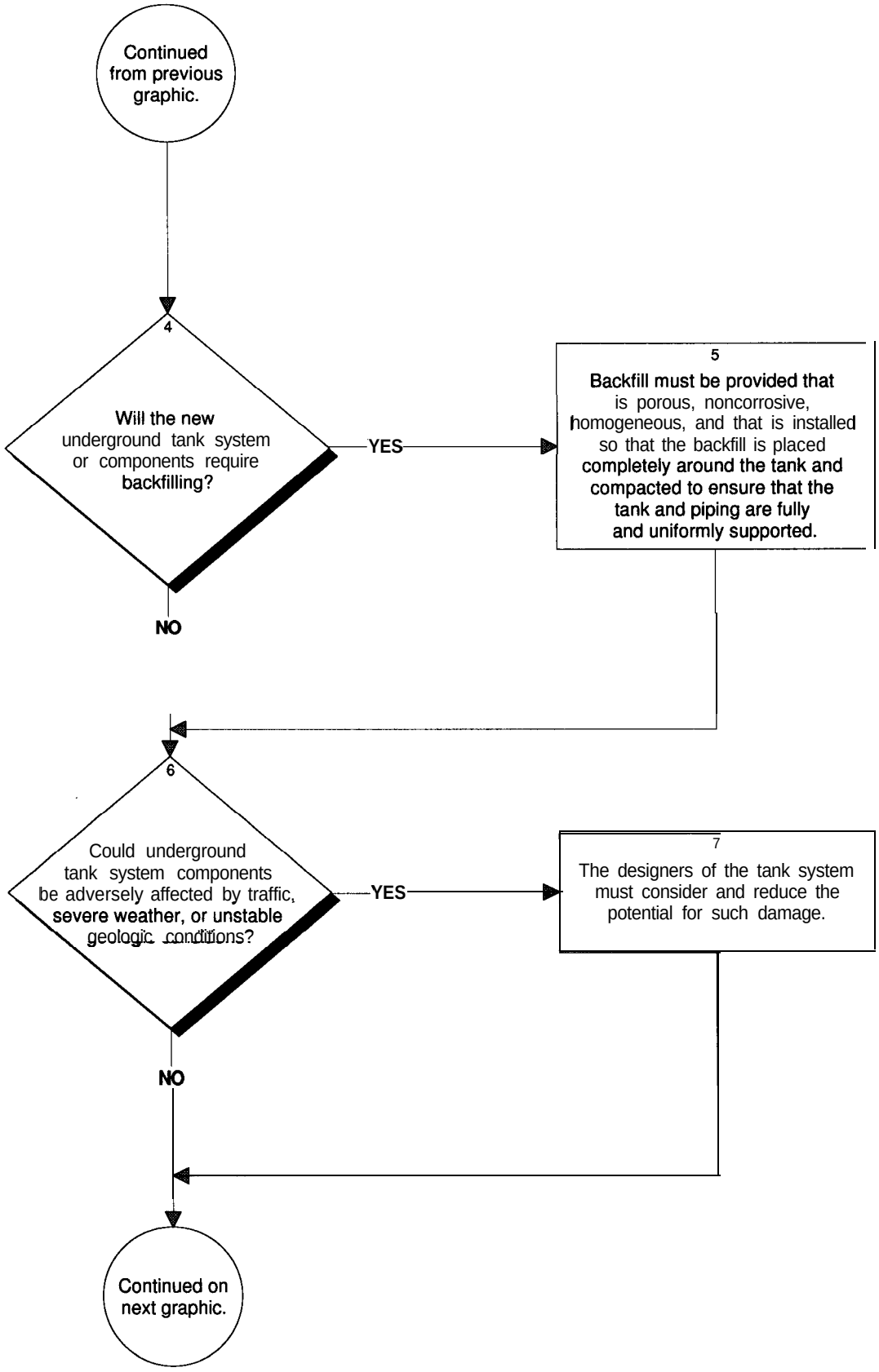
Step 2 Owners or operators of new HW tank systems or components must obtain a written assessment of the HW tank's design. This assessment must be reviewed and certified by an independent, qualified, registered professional engineer, in accordance with 40 CFR 270.11(d). The assessment must be submitted to the Regional Administrator, for approval, with Part B of the permit application. An interim status facility does not need to submit the assessment to the Regional Administration.

The assessment must show that the foundation, structural support, seams, connections, and pressure controls (if applicable) are adequately designed, and that the tank system has sufficient structural strength, and compatibility with the HW being stored or treated to ensure that it will not collapse, rupture, or fail. It must include, at a minimum, the following information:

- Design standard(s) according to which tank(s) and/or ancillary equipment are constructed;
- Characteristics of the HW to be handled;
- The following determinations by a corrosion expert, if the external shell of a metal tank or any external metal component of the tank system will be in contact with the soil or water:
  - Factors affecting the potential for corrosion, including but not limited to:
    (a) Soil: moisture content, pH, sulfide levels, resistivity, and structure-to-soil potential;
    (b) Influence of nearby underground metal structures such as piping;
    (c) Existence of stray electric current;
    (d) Existing corrosion-protection measures; and
  - The type and degree of external corrosion protection needed to ensure the integrity of the tank system, consisting of one or more of the following:
    (a) Corrosion-resistant materials of construction such as special alloys, fiberglass reinforced plastic, etc.;
    (b) Corrosion-resistant coating with cathodic protection such as impressed current or sacrificial anodes (see the Glossary in Appendix A for these definitions); and
    (c) Electrical isolation devices such as insulating joints.

Note: The practices described in the National Association of Corrosion Engineers [NACE] standard, "Recommended Practice [RP-02-85]--Control of External Corrosion on Metallic Buried, Partially Buried, or Submerged Liquid Storage Systems" and the American Petroleum Institute (API) Publication 1632, "Cathodic Protection of Underground Petroleum Storage Tanks and Piping Systems" may be used. [6], [7]

Step 3 If the design assessment does not address all required elements, it cannot be used to provide proof of the safety of the proposed HW tank. [4]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4
Will the new underground tank system or components require backfilling?
YES
NO
5
Backfill must be provided that is porous, noncorrosive, homogeneous, and that is installed so that the backfill is placed completely around the tank and compacted to ensure that the tank and piping are fully and uniformly supported.
6
Could underground tank system components be adversely affected by traffic, severe weather, or unstable geologic conditions?
YES
NO
7
The designers of the tank system must consider and reduce the potential for such damage.
Continued on next graphic.

Step 4 Backfill often provides vital structural support to the HW tank and ancillary equipment. For example, uniform, well compacted backfill provides much (up to 90%) of a fiber-reinforced plastic tank's structural support.

Step 5 The use of inappropriate backfill material can void a manufacturer's warranty. Backfill material for steel or composite tanks is different from that for nonmetallic tanks. Generally, steel or composite tanks should be backfilled with washed, well granulated, free-flowing sand or gravel that is not bigger than 1/8 inch. Nonmetallic tanks should be backfilled with pea gravel (rounded particles between 1/8 and 3/4 inch) or crushed rock or gravel (defined as washed and free-flowing angular particles between 1/8 and 1/2 inch). [4]

Step 6 Operational measures that can be used to reduce excessive vehicular loads on a HW tank include instituting a weight limit on vehicles traveling above a HW tank (or system components) and/or constructing barricades or guardrails around those tank system components that are susceptible to damage from heavy loads. [4]

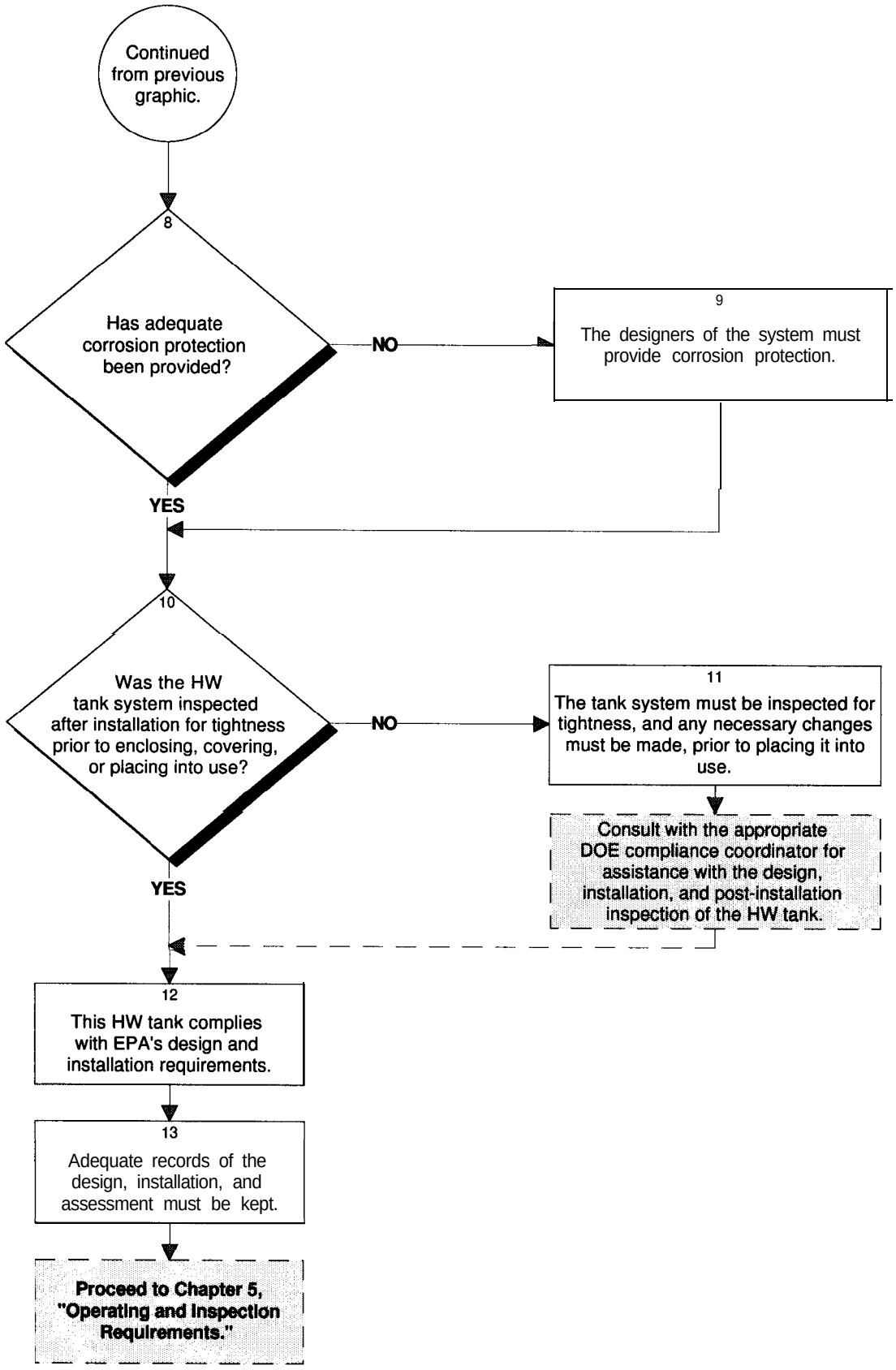
The design of the HW tank must also protect the tank from severe weather or unusual geologic conditions. The designers must ensure (where necessary) that:

- Tank foundations will maintain the load of a full tank;
- Tank systems will be anchored to prevent flotation or dislodgment where the tank system is placed in a saturated zone or is located within a seismic fault zone subject to the location standards of 40 CFR 264/265.18(a); and
- Tank systems will withstand the effects of frost heave.

Ancillary equipment must be supported and protected against physical damage and excessive stress due to vibration, expansion, or contraction.

Step 7 The designers may need to scale down the size of the proposed HW tank or use alternative materials to reduce the potential for damage to the HW tank system by traffic or other hazards. The consideration of damage by traffic may be very important when replacing a HW tank in an area that has grown in size/density since the placement of the original HW tank (or in an area for which growth is planned).

Note: The piping system installation procedures described in API Publication 1615, "Installation of Underground Petroleum Transportation Piping System," may be used, where applicable, as guidelines for proper installation of piping systems. [8]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8
Has adequate corrosion protection been provided?
NO
9
The designers of the system must provide corrosion protection.
YES
10
Was the HW tank system inspected after installation for tightness prior to enclosing, covering, or placing into use?
NO
11
The tank system must be inspected for tightness, and any necessary changes must be made, prior to placing it into use.
Consult with the appropriate DOE compliance coordinator for assistance with the design, installation, and post-installation inspection of the HW tank.
YES
12
This HW tank complies with EPA's design and installation requirements.
13
Adequate records of the design, installation, and assessment must be kept.
Proceed to Chapter 5, "Operating and Inspection Requirements."

Step 8 The owner or operator must provide the type and degree of corrosion protection recommended by an independent corrosion expert (based on the information provided under Step 2) or other corrosion protection (if the Regional Administrator believes other corrosion protection is necessary) to ensure the integrity of the tank system during its use. The installation of a corrosion protection system that is field fabricated must be supervised by an independent corrosion expert.

Step 9 Without adequate corrosion protection, the HW tank is not only in a state of non-compliance with the regulations, it also is susceptible to premature failure due to exposure to corrosion-inducing elements (e.g., water or acidic soil conditions). [4]

Step 10 To prevent damage to the system during installation, the owner or operator of a new tank system must ensure that proper handling procedures are followed. An independent, qualified installation inspector or registered professional engineer, trained and experienced in the proper installation of tank systems or components, must inspect the system. He/she must test and search for the presence of weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, or other structural damage or inadequate construction/installation.

Once the HW tank has been designed, installed, and assessed in accordance with EPA regulations, a copy of the written assessment of the HW tank system's design must be included in Part B of the permit application as specified in 40 CFR 270.16.

Step 11 All necessary repairs must be made before the tank system is covered, enclosed, or placed in use. A repaired tank or piping that is partially or totally below ground level should be retested before backfilling or burial.

Step 12 While this HW tank complies with the minimum design and installation requirements for HW tanks, the Regional Administrator may impose additional requirements (as needed) as a condition of the permit application.

Step 13 The owner or operator must obtain and keep on file at the facility written statements by those persons required to certify the design of the tank system and supervise its installation, attesting that the tank system was properly designed and installed, and that repairs (where necessary) were performed. These written statements must also include the certification statement as required by 40 CFR 270.11(d).

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